



TEST REPORT

ACCORDING TO IES LM-80-2015
For

Hongli Zhihui Group Co.,Ltd. Guangzhou Branch

Room 316, Building 2, No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China

Model: HL-AS-2835DVW-2C-S1-08-PCT-HR3 (R9)

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Pote Wang	<i>Pote Wang</i>	
Report Number:	RSZ161122518-10-9000-M2		
Test Date:	2016-11-29 to 2017-12-09		
Report Date:	2019-01-14		
Reviewed By:	Daniel Duan / EE Manager	<i>Daniel Duan</i>	
Revised Note:	The previous report RSZ161122518-10-9000-M1 is replaced by this report on 2019-01-14		
Test Facility:	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.		
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588		

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).
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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

50 PCS samples were received on 2016-11-22. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-AS-2835DVW-2C-S1-08-PCT-HR3 (R9)
Part Type:	LED Package
Drive Level:	DC 60mA
Nominal CCT:	2700K
Power:	1.2W
Current Density per LED die:	272.73mA/mm ²
Power Density per LED die:	2.727W/mm ²
CRI:	80
Die Spacing:	0.15mm

Family products covered by this report:

According to ENERGY STAR® Requirements for the Use of LM-80 Data, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of ENERGY STAR® Requirements for the Use of LM-80 Data (September 28, 2017)

This report covers the following models:

Model type	Model name	CRI (typ.)	CCT (typ.)	Series	Parallel	Power density (W/mm ²)	Current density per LED die (mA/mm ²)	Current per die (mA)	Distance between of dies	Current (mA)
Tested model	HL-AS-2835DVW-2C-S1-08-PCT-HR3(R9)	80	2700K	2	1	0.1163	272.73	60	0.15	60
Multiple models	HL-AS-2835DVW-2C-S1-08-PCT-HR3	80	>2200K	2	1	0.1163	272.73	60	0.15	60
Multiple models	HL-AS-PU2835DVW-2C-S1-08-PCT-HR3(R9)	80	>2200K	2	1	0.1163	272.73	60	0.15	60
Multiple models	HL-AS-PU2835DVW-2C-S1-08-PCT-HR3	80	>2200K	2	1	0.1163	272.73	60	0.15	60
Multiple models	HL-AS-2835DVW-2C-S1-08L-PCT-HR3(R9)	80	>2200K	2	1	0.1163	272.73	60	0.15	60
Multiple models	HL-AS-2835DVW-2C-S1-08L-PCT-HR3	80	>2200K	2	1	0.1163	272.73	60	0.15	60
Multiple models	HL-AS-PU2835DVW-2C-S1-08L-PCT-HR3(R9)	80	>2200K	2	1	0.1163	272.73	60	0.15	60
Multiple models	HL-AS-PU2835DVW-2C-S1-08L-PCT-HR3	80	>2200K	2	1	0.1163	272.73	60	0.15	60
Multiple models	HL-AS-2835HVW-2C-S1-08-PCT-HR3(R9)	80	>2200K	2	1	0.0566	132.10	30	0.15	30

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Multiple models	HL-AS-2835HVW-2C-S1-08-PCT-HR3	80	>2200K	2	1	0.0566	132.10	30	0.15	30
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Multiple models	HL-AS-PU2835HVW-2C-S1-08L-PCT-HR3	80	>2200K	2	1	0.0566	132.10	30	0.15	30
Multiple models	HL-AS-2835VHW-2C-S1-08-PCT-HR3(R9)	80	>2200K	2	1	0.0566	255.50	30	0.15	30
Multiple models	HL-AS-2835VHW-2C-S1-08-PCT-HR3	80	>2200K	2	1	0.0566	255.50	30	0.15	30
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Multiple models	HL-AS-2835FVW-S1-08-PCT-HR3	80	>2200K	1	1	0.1163	107.64	60	/	60
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Multiple models	HL-AS-2835DVW-S1-08-PCT-HR3(R9)	80	>2200K	1	1	0.0582	105.20	30	/	30

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Multiple models	HL-AS-PU2835VDW-S1-08L-PCT-HR3(R9)	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	HL-A-PU2835VDW-S1-08L-PCT-HR3	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	HL-A-2835DVW-2C-S1-08-PCT-HR3(R9)	80	>2200K	2	1	0.1163	272.73	60	0.15	60
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Multiple models	HL-A-PU2835VHW-2C-S1-08L-PCT-HR3	80	>2200K	2	1	0.0566	255.50	30	0.15	30
Multiple models	HL-A-2835FVW-S1-08-PCT-HR3	80	>2200K	1	1	0.1163	107.64	60	/	60
Multiple models	HL-A-2835FVW-S1-08-PCT-HR3(R9)	80	>2200K	1	1	0.1163	107.64	60	/	60
Multiple models	HL-A-PU2835FVW-S1-08-PCT-HR3	80	>2200K	1	1	0.1163	107.64	60	/	60
Multiple models	HL-A-PU2835FVW-S1-08-PCT-HR3(R9)	80	>2200K	1	1	0.1163	107.64	60	/	60
Multiple models	HL-A-2835FVW-S1-08L-PCT-HR3	80	>2200K	1	1	0.1163	107.64	60	/	60
Multiple models	HL-A-2835FVW-S1-08L-PCT-HR3(R9)	80	>2200K	1	1	0.1163	107.64	60	/	60
Multiple models	HL-A-PU2835FVW-S1-08L-PCT-HR3	80	>2200K	1	1	0.1163	107.64	60	/	60
Multiple models	HL-A-PU2835FVW-S1-08L-PCT-HR3(R9)	80	>2200K	1	1	0.1163	107.64	60	/	60
Multiple models	HL-A-2835DVW-S1-08-PCT-HR3(R9)	80	>2200K	1	1	0.0582	105.20	30	/	30
Multiple models	HL-A-2835DVW-S1-08-PCT-HR3	80	>2200K	1	1	0.0582	105.20	30	/	30

Model type	Model name	CRI (typ.)	CCT (typ.)	Series	Parallel	Power density (W/mm ²)	Current density per LED die (mA/mm ²)	Current per die (mA)	Distance between of dies	Current (mA)
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Multiple models	HL-A-PU2835DVW-S1-08-PCT-HR3	80	>2200K	1	1	0.0582	105.20	30	/	30
Multiple models	HL-A-2835DVW-S1-08L-PCT-HR3(R9)	80	>2200K	1	1	0.0582	105.20	30	/	30
Multiple models	HL-A-2835DVW-S1-08L-PCT-HR3	80	>2200K	1	1	0.0582	105.20	30	/	30
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Multiple models	HL-A-2835VDW-S1-08-PCT-HR3	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	HL-A-PU2835VDW-S1-08-PCT-HR3(R9)	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	HL-A-PU2835VDW-S1-08-PCT-HR3	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	HL-A-2835VDW-S1-08L-PCT-HR3(R9)	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	HL-A-2835VDW-S1-08L-PCT-HR3	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	HL-A-PU2835VDW-S1-08L-PCT-HR3(R9)	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	HL-A-PU2835VDW-S1-08L-PCT-HR3	80	>2200K	1	1	0.0582	134.78	30	/	30
Multiple models	SL-*B2835FTA-21CCG	80	>2200K	2	1	0.1163	267.95	60	0.15	60
Multiple models	SL-*B2835FTA-21CCGH	80	>2200K	2	1	0.1163	267.95	60	0.15	60
Multiple models	SL-*B2835FTA-21CCH	80	>2200K	2	1	0.1163	242.19	60	0.15	60
Multiple models	SL-*B2835FTA-21CCHH	80	>2200K	2	1	0.1163	242.19	60	0.15	60
Multiple models	SL-*B2835FTA-12CDG	80	>2200K	1	2	0.1163	149.04	30	0.15	60
Multiple models	SL-*B2835FTA-12CDGH	80	>2200K	1	2	0.1163	149.04	30	0.15	60
Multiple models	SL-*B2835FTA-12CDH	80	>2200K	1	2	0.1163	121.09	30	0.15	60
Multiple models	SL-*B2835FTA-12CDHH	80	>2200K	1	2	0.1163	121.09	30	0.15	60
Multiple models	SL-*B2835FTA-11CDK	80	>2200K	1	1	0.1163	103.79	60	/	60
Multiple models	SL-*B2835FTA-11CDKH	80	>2200K	1	1	0.1163	103.79	60	/	60

1.2 Standards Used:

- IESNA LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by IAS)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	0.3m	2017-03-09	2018-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2017-03-03	2018-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2017-03-09	2018-03-09
Standard Light Source	EVERFINE	D062	1011093	3000K	2017-09-13	2018-09-13
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ73 21114	300VA	2017-03-03	2018-03-03
Multilayer aging machine	BACL	B2-270	20015	25°C~130°C	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090008	(50/15A)	2017-07-07	2018-07-07
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50/15A)	2017-07-07	2018-07-07

1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within $\pm 3\%$ of the specified value of the manufacturer during maintenance test, and was within $\pm 0.5\%$ during photometric and electrical measurement test.

1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP_{LED}) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP_{LED} of the coldest LEDs were maintained at a temperature that was greater than or equal to 2°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°C below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 “Special Limits”.

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within $\pm 3\%$ of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, RH $< 65\%$.

1.6 Measurement Uncertainty

The uncertainty of the light output measurements is $U=1.59\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=21\text{K}$ ($K=2$), at the 95% confidence level.

The uncertainty of the temperature is $U=0.8671^{\circ}\text{C}$ ($K=2$), at the 95% confidence level.

1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

1.8 Sample Set

Data Set 1: 55°C, 60mA

Part Number: HL-AS-2835DVW-2C-S1-08-PCT-HR3 (R9)
Number of Units: 25
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 60mA
Measurement Current: 60mA

Data Set 2: 105°C, 60mA

Part Number: HL-AS-2835DVW-2C-S1-08-PCT-HR3 (R9)
Number of Units: 25
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 60mA
Measurement Current: 60mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval(hours)	Test Duration(hours)	Reported TM-21 L ₇₀ Lifetime
1	25	0	1000	9000	>54000hours
2	25	0	1000	9000	>54000hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	100.28%	100.11%	99.93%	99.72%	99.51%	99.33%	99.10%	98.87%	98.64%
2	99.82%	99.52%	99.22%	98.88%	98.61%	98.33%	98.04%	97.78%	97.49%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	0.0003	0.0007	0.0009	0.0013	0.0015	0.0018	0.0020	0.0025	0.0026
2	0.0005	0.0008	0.0012	0.0015	0.0018	0.0019	0.0022	0.0023	0.0028

3 - Test Data

3.1 Data Set 1, 55°C, 60mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	127.9	100.23	100.08	99.92	99.61	99.37	99.30	99.06	98.75	98.51
2	128.1	100.23	100.16	99.92	99.77	99.53	99.38	99.06	98.91	98.67
3	125.9	100.32	100.24	100.16	99.92	99.68	99.52	99.21	99.05	98.73
4	131.8	100.08	99.85	99.77	99.70	99.39	99.32	99.09	98.94	98.86
5	127.2	100.39	100.24	99.92	99.76	99.61	99.29	98.98	98.74	98.43
6	131.8	100.38	100.15	99.85	99.54	99.32	99.24	99.09	98.86	98.63
7	131.4	100.30	99.85	99.77	99.54	99.24	99.01	98.78	98.55	98.33
8	130.2	100.08	99.92	99.69	99.62	99.31	99.16	98.85	98.54	98.16
9	133.2	100.30	100.15	99.92	99.70	99.55	99.40	99.32	99.25	98.95
10	129.4	100.31	100.08	99.92	99.85	99.61	99.54	99.38	99.15	99.00
11	127.2	100.39	100.24	100.08	99.76	99.53	99.14	98.98	98.90	98.66
12	129.5	100.31	100.15	99.92	99.77	99.46	99.23	99.00	98.69	98.61
13	134.4	100.37	100.22	100.15	99.93	99.70	99.33	99.03	98.81	98.66
14	131.1	100.15	100.08	99.85	99.62	99.47	99.24	99.01	98.86	98.55
15	126.5	100.32	100.16	100.08	99.92	99.84	99.68	99.45	99.21	99.05
16	132.5	100.38	100.15	99.92	99.70	99.40	99.25	99.09	98.79	98.49
17	128.1	100.39	100.23	100.08	99.77	99.53	99.38	99.14	98.99	98.67
18	129.4	100.31	100.15	99.85	99.61	99.46	99.38	99.23	98.92	98.69
19	134.6	100.37	100.22	99.93	99.63	99.41	99.26	99.03	98.74	98.51
20	126.9	100.32	100.24	100.16	99.84	99.68	99.45	99.29	99.05	98.82
21	131.7	100.15	99.77	99.70	99.54	99.32	99.09	98.86	98.63	98.41
22	131.0	100.23	100.08	99.92	99.77	99.47	99.31	99.01	98.93	98.70
23	129.4	100.39	100.23	100.15	99.85	99.77	99.69	99.46	99.23	99.07
24	133.2	100.08	99.85	99.70	99.55	99.40	99.25	98.95	98.57	98.42
25	122.2	100.33	100.16	99.92	99.84	99.67	99.43	99.18	98.77	98.45
Ave.	129.8	100.28	100.11	99.93	99.72	99.51	99.33	99.10	98.87	98.64
Med.	129.5	100.31	100.15	99.92	99.76	99.47	99.31	99.06	98.86	98.66
st dev	2.9426	0.1039	0.1435	0.1449	0.1245	0.1567	0.1643	0.1785	0.2051	0.2288
Min.	122.2	100.08	99.77	99.69	99.54	99.24	99.01	98.78	98.54	98.16
Max.	134.6	100.39	100.24	100.16	99.93	99.84	99.69	99.46	99.25	99.07

TM-21 Projection:

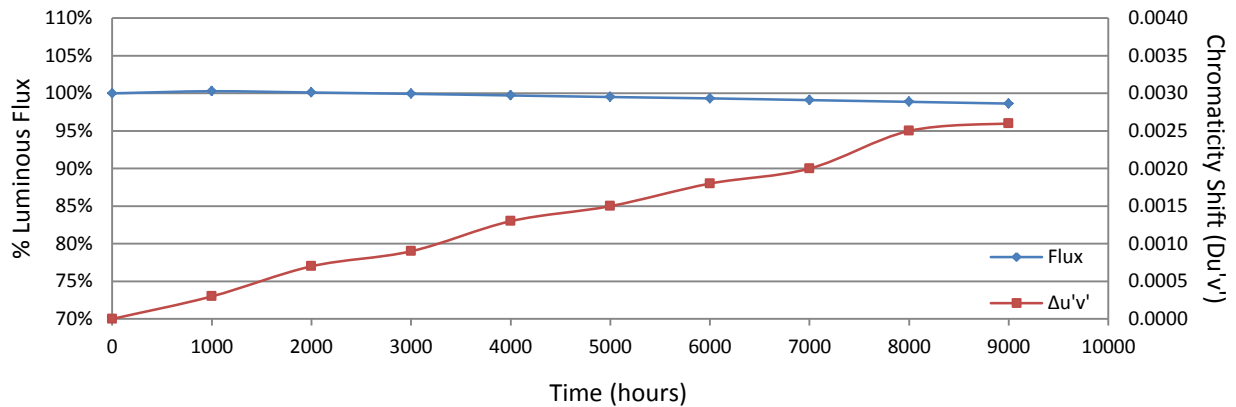
Test Duration: 9000 hours
Failures Observed: 0
 α : 2.175E-06
 β : 1.006
Reported L₇₀: >54000 hours

3.2 Data Set 1, 55°C, 60mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	18.79	18.76	18.69	18.74	18.70	18.67	18.75	18.77	18.79	18.80
2	18.87	18.86	18.80	18.83	18.81	18.76	18.78	18.81	18.79	18.81
3	18.78	18.78	18.71	18.74	18.71	18.68	18.69	18.71	18.71	18.74
4	18.93	18.92	18.86	18.89	18.88	18.83	18.84	18.87	18.88	18.89
5	18.68	18.68	18.61	18.64	18.63	18.58	18.59	18.62	18.62	18.63
6	18.87	18.88	18.82	18.85	18.83	18.79	18.79	18.81	18.82	18.83
7	18.87	18.87	18.81	18.84	18.82	18.78	18.78	18.81	18.81	18.82
8	18.71	18.72	18.65	18.67	18.67	18.62	18.63	18.66	18.65	18.66
9	18.72	18.74	18.67	18.69	18.68	18.63	18.65	18.68	18.67	18.69
10	18.77	18.79	18.71	18.73	18.72	18.68	18.70	18.72	18.71	18.74
11	18.82	18.85	18.77	18.79	18.78	18.73	18.75	18.77	18.77	18.78
12	18.96	19.00	18.91	18.93	18.91	18.87	18.88	18.92	18.91	18.93
13	18.72	18.75	18.68	18.68	18.67	18.64	18.65	18.67	18.68	18.70
14	19.09	19.11	19.04	19.05	19.02	18.99	19.00	19.02	19.02	19.07
15	18.85	18.88	18.80	18.81	18.80	18.77	18.76	18.79	18.79	18.83
16	18.85	18.88	18.79	18.81	18.80	18.77	18.76	18.79	18.78	18.83
17	18.76	18.80	18.71	18.73	18.72	18.69	18.69	18.71	18.70	18.74
18	18.90	18.92	18.85	18.86	18.87	18.83	18.83	18.85	18.85	18.88
19	18.71	18.74	18.66	18.67	18.66	18.66	18.63	18.65	18.66	18.68
20	18.74	18.78	18.70	18.71	18.71	18.68	18.66	18.70	18.71	18.72
21	19.02	19.05	18.96	18.97	18.98	18.95	18.94	18.96	18.96	18.98
22	18.94	18.97	18.88	18.90	18.90	18.87	18.86	18.88	18.88	18.90
23	18.94	18.96	18.90	18.90	18.90	18.88	18.87	18.89	18.89	18.91
24	18.79	18.82	18.74	18.75	18.75	18.72	18.73	18.75	18.74	18.77
25	18.79	18.83	18.75	18.78	18.75	18.73	18.65	18.93	18.74	18.76
Ave.	18.83	18.85	18.78	18.80	18.79	18.75	18.75	18.79	18.78	18.80
Med.	18.82	18.85	18.77	18.79	18.78	18.73	18.75	18.79	18.78	18.80
st dev	0.1049	0.1070	0.1061	0.1039	0.1046	0.1053	0.1045	0.1056	0.1021	0.1054
Min.	18.68	18.68	18.61	18.64	18.63	18.58	18.59	18.62	18.62	18.63
Max.	19.09	19.11	19.04	19.05	19.02	18.99	19.00	19.02	19.02	19.07

3.3 Data Set 1, 55°C, 60mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2572	0.5289	2806	0.0003	0.0008	0.0010	0.0012	0.0015	0.0019	0.0020	0.0023	0.0026
2	0.2605	0.5323	2721	0.0004	0.0007	0.0010	0.0011	0.0012	0.0017	0.0021	0.0022	0.0025
3	0.2585	0.5296	2775	0.0004	0.0007	0.0010	0.0014	0.0013	0.0018	0.0022	0.0023	0.0027
4	0.2553	0.5308	2839	0.0003	0.0007	0.0009	0.0014	0.0015	0.0016	0.0023	0.0025	0.0026
5	0.2571	0.5279	2812	0.0002	0.0006	0.0009	0.0013	0.0015	0.0015	0.0021	0.0024	0.0025
6	0.2568	0.5323	2799	0.0004	0.0007	0.0009	0.0013	0.0015	0.0014	0.0021	0.0025	0.0027
7	0.2573	0.5278	2808	0.0004	0.0009	0.0011	0.0015	0.0018	0.0021	0.0026	0.0029	0.0030
8	0.2577	0.5287	2796	0.0006	0.0010	0.0014	0.0019	0.0022	0.0026	0.0029	0.0034	0.0035
9	0.2557	0.5299	2833	0.0003	0.0006	0.0007	0.0012	0.0013	0.0016	0.0016	0.0021	0.0021
10	0.2567	0.5279	2822	0.0003	0.0007	0.0009	0.0013	0.0015	0.0019	0.0020	0.0024	0.0025
11	0.2575	0.5290	2799	0.0002	0.0006	0.0009	0.0013	0.0015	0.0019	0.0020	0.0024	0.0026
12	0.2577	0.5318	2781	0.0001	0.0004	0.0007	0.0011	0.0012	0.0015	0.0017	0.0021	0.0022
13	0.2561	0.5293	2827	0.0001	0.0005	0.0009	0.0012	0.0014	0.0017	0.0019	0.0022	0.0023
14	0.2568	0.5320	2801	0.0003	0.0007	0.0009	0.0013	0.0016	0.0018	0.0020	0.0024	0.0026
15	0.2585	0.5305	2770	0.0001	0.0005	0.0006	0.0010	0.0011	0.0015	0.0017	0.0021	0.0022
16	0.2561	0.5304	2823	0.0004	0.0007	0.0010	0.0014	0.0017	0.0019	0.0021	0.0025	0.0028
17	0.2582	0.5289	2784	0.0001	0.0004	0.0009	0.0012	0.0015	0.0016	0.0019	0.0024	0.0025
18	0.2567	0.5281	2819	0.0002	0.0006	0.0010	0.0014	0.0015	0.0018	0.0020	0.0026	0.0027
19	0.2599	0.5320	2735	0.0003	0.0007	0.0010	0.0014	0.0017	0.0021	0.0023	0.0027	0.0029
20	0.2605	0.5283	2738	0.0002	0.0007	0.0009	0.0012	0.0014	0.0017	0.0019	0.0024	0.0026
21	0.2583	0.5310	2773	0.0003	0.0007	0.0011	0.0014	0.0015	0.0018	0.0021	0.0026	0.0028
22	0.2571	0.5322	2793	0.0003	0.0006	0.0009	0.0013	0.0014	0.0016	0.0019	0.0023	0.0026
23	0.2572	0.5276	2812	0.0004	0.0007	0.0009	0.0013	0.0014	0.0017	0.0019	0.0023	0.0025
24	0.2586	0.5306	2768	0.0002	0.0006	0.0009	0.0013	0.0015	0.0017	0.0020	0.0025	0.0027
25	0.2577	0.5291	2794	0.0003	0.0007	0.0009	0.0012	0.0013	0.0016	0.0018	0.0029	0.0034
Ave.	0.2576	0.5299	2793	0.0003	0.0007	0.0009	0.0013	0.0015	0.0018	0.0020	0.0025	0.0026
Med.	0.2573	0.5296	2799	0.0003	0.0007	0.0009	0.0013	0.0015	0.0017	0.0020	0.0024	0.0026
st dev	0.0013	0.0016	30.4321	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
Min.	0.2553	0.5276	2721	0.0001	0.0004	0.0006	0.0010	0.0011	0.0014	0.0016	0.0021	0.0021
Max.	0.2605	0.5323	2839	0.0006	0.0010	0.0014	0.0019	0.0022	0.0026	0.0029	0.0034	0.0035



3.4 Data Set 2, 105°C, 60mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	136.5	99.85	99.56	99.34	99.12	98.83	98.68	98.39	98.02	97.73
27	129.5	99.77	99.54	99.31	99.00	98.76	98.53	98.38	98.15	97.92
28	124.3	99.84	99.36	99.03	98.79	98.47	98.15	97.99	97.91	97.83
29	133.0	99.85	99.47	99.02	98.72	98.35	98.20	97.82	97.44	97.22
30	127.3	99.76	99.45	99.14	98.74	98.43	98.27	97.80	97.49	97.25
31	130.7	99.77	99.46	99.08	98.85	98.55	98.09	97.86	97.48	97.25
32	127.7	99.84	99.45	99.14	98.67	98.43	98.04	97.81	97.65	97.34
33	130.3	99.92	99.62	99.39	98.93	98.70	98.39	98.08	98.00	97.70
34	128.3	99.92	99.53	99.22	99.06	98.67	98.36	98.13	97.97	97.74
35	132.4	99.77	99.47	98.94	98.56	98.34	98.19	97.89	97.51	97.36
36	129.8	99.92	99.69	99.46	99.08	98.92	98.69	98.46	98.00	97.69
37	130.0	99.85	99.62	99.31	99.00	98.62	98.38	98.08	97.69	97.31
38	127.1	99.84	99.53	99.37	99.13	98.90	98.66	98.51	98.19	97.88
39	128.6	99.84	99.46	99.14	98.91	98.68	98.37	97.90	97.74	97.43
40	127.2	99.76	99.45	99.37	98.98	98.58	98.27	97.88	97.48	97.25
41	128.6	99.69	99.46	99.30	98.99	98.83	98.52	98.13	97.90	97.59
42	129.9	99.85	99.38	99.00	98.77	98.69	98.23	98.00	97.77	97.54
43	134.2	99.78	99.63	99.18	98.66	98.36	98.06	97.62	97.47	97.17
44	130.7	99.77	99.46	99.23	99.01	98.62	98.39	98.09	98.01	97.63
45	132.4	99.85	99.62	99.32	99.02	98.64	98.41	98.04	97.89	97.66
46	132.4	99.92	99.55	99.17	98.72	98.41	98.11	97.89	97.51	97.05
47	128.7	99.77	99.69	99.38	98.91	98.60	98.29	98.06	97.82	97.51
48	129.0	99.84	99.53	99.30	98.76	98.53	98.22	97.91	97.67	97.36
49	128.9	99.69	99.46	99.07	98.76	98.53	98.14	97.98	97.75	97.36
50	128.0	99.84	99.61	99.38	98.98	98.83	98.52	98.28	97.89	97.58
Ave.	129.8	99.82	99.52	99.22	98.88	98.61	98.33	98.04	97.78	97.49
Med.	129.5	99.84	99.53	99.23	98.91	98.62	98.29	98.00	97.77	97.51
st dev	2.6042	0.0661	0.0895	0.1439	0.1591	0.1731	0.1932	0.2237	0.2300	0.2385
Min.	124.3	99.69	99.36	98.94	98.56	98.34	98.04	97.62	97.44	97.05
Max.	136.5	99.92	99.69	99.46	99.13	98.92	98.69	98.51	98.19	97.92

TM-21 Projection:

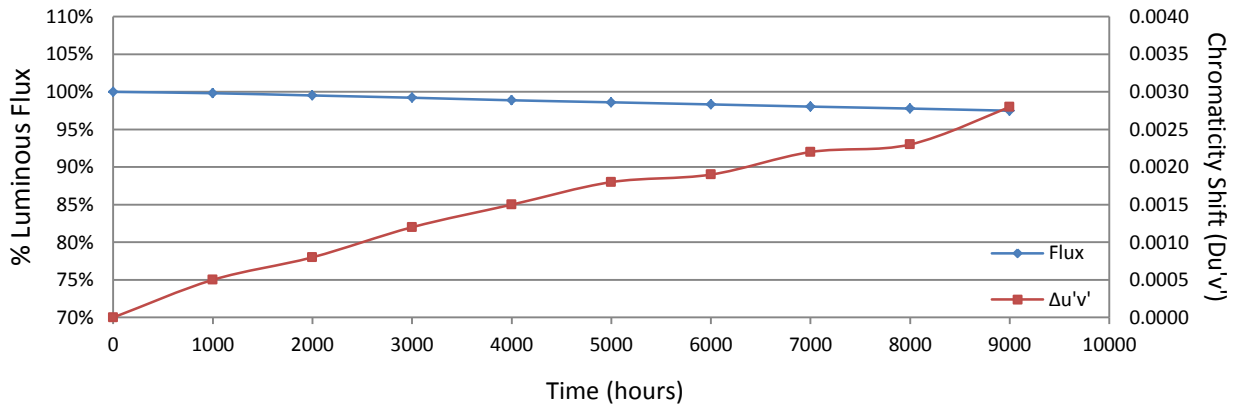
Test Duration: 9000 hours
Failures Observed: 0
 α : 2.831E-06
 β : 1.000
Reported L₇₀: >54000 hours

3.5 Data Set 2, 105°C, 60mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	18.70	18.76	18.68	18.70	18.69	18.67	18.65	18.68	18.66	18.69
27	18.85	18.90	18.82	18.83	18.82	18.80	18.78	18.82	18.80	18.82
28	18.82	18.86	18.79	18.80	18.78	18.77	18.76	18.78	18.76	18.79
29	18.63	18.67	18.60	18.60	18.59	18.58	18.57	18.59	18.57	18.59
30	18.85	18.89	18.81	18.81	18.80	18.79	18.79	18.80	18.80	18.81
31	18.85	18.89	18.80	18.81	18.80	18.80	18.80	18.80	18.79	18.81
32	18.81	18.84	18.76	18.77	18.76	18.77	18.76	18.77	18.76	18.79
33	18.72	18.75	18.68	18.68	18.67	18.68	18.67	18.68	18.68	18.70
34	18.69	18.72	18.66	18.67	18.65	18.65	18.64	18.65	18.67	18.67
35	18.84	18.89	18.80	18.81	18.80	18.80	18.78	18.80	18.81	18.82
36	18.76	18.80	18.72	18.72	18.71	18.72	18.70	18.72	18.73	18.73
37	18.76	18.79	18.72	18.74	18.71	18.71	18.70	18.73	18.74	18.73
38	18.93	18.96	18.88	18.91	18.87	18.87	18.86	18.88	18.89	18.89
39	18.97	19.00	18.92	18.94	18.91	18.90	18.91	18.92	18.93	18.93
40	18.76	18.79	18.72	18.74	18.72	18.71	18.71	18.72	18.73	18.72
41	18.76	18.81	18.72	18.75	18.72	18.71	18.71	18.73	18.73	18.74
42	18.85	18.89	18.81	18.83	18.80	18.80	18.78	18.80	18.81	18.82
43	18.68	18.71	18.66	18.65	18.62	18.65	18.61	18.63	18.63	18.64
44	19.07	19.11	19.02	19.04	19.01	19.03	18.99	19.02	19.03	19.03
45	18.77	18.81	18.74	18.77	18.72	18.73	18.70	18.73	18.74	18.75
46	18.93	18.97	18.89	18.91	18.88	18.88	18.86	18.89	18.88	18.92
47	19.03	19.05	18.98	19.00	18.96	18.96	18.94	18.97	18.97	19.00
48	18.80	18.82	18.75	18.78	18.74	18.75	18.72	18.75	18.74	18.77
49	18.96	18.97	18.90	18.93	18.88	18.89	18.87	18.90	18.89	18.91
50	18.95	18.96	18.89	18.93	18.88	18.89	18.86	18.89	18.89	18.91
Ave.	18.83	18.86	18.79	18.80	18.78	18.78	18.76	18.79	18.79	18.80
Med.	18.82	18.86	18.79	18.80	18.78	18.77	18.76	18.78	18.76	18.79
st dev	0.1129	0.1095	0.1054	0.1116	0.1051	0.1063	0.1048	0.1071	0.1091	0.1099
Min.	18.63	18.67	18.60	18.60	18.59	18.58	18.57	18.59	18.57	18.59
Max.	19.07	19.11	19.02	19.04	19.01	19.03	18.99	19.02	19.03	19.03

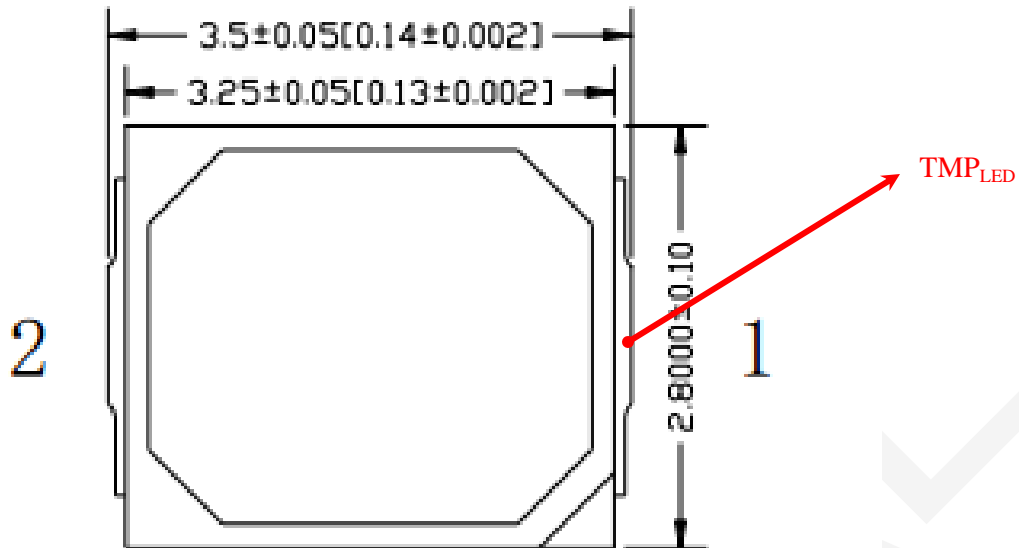
3.6 Data Set 2, 105°C, 60mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2594	0.5310	2749	0.0007	0.0009	0.0014	0.0017	0.0018	0.0021	0.0025	0.0023	0.0032
27	0.2581	0.5319	2774	0.0004	0.0007	0.0010	0.0013	0.0015	0.0015	0.0019	0.0018	0.0026
28	0.2587	0.5315	2763	0.0004	0.0006	0.0009	0.0013	0.0015	0.0016	0.0019	0.0019	0.0026
29	0.2586	0.5360	2746	0.0006	0.0007	0.0011	0.0015	0.0017	0.0018	0.0022	0.0022	0.0029
30	0.2572	0.5290	2805	0.0004	0.0006	0.0010	0.0014	0.0016	0.0017	0.0018	0.0020	0.0026
31	0.2568	0.5289	2815	0.0003	0.0004	0.0009	0.0013	0.0015	0.0013	0.0017	0.0019	0.0025
32	0.2597	0.5288	2753	0.0005	0.0007	0.0012	0.0015	0.0019	0.0017	0.0022	0.0022	0.0029
33	0.2549	0.5315	2844	0.0006	0.0007	0.0011	0.0015	0.0019	0.0017	0.0022	0.0023	0.0029
34	0.2584	0.5284	2783	0.0005	0.0007	0.0010	0.0015	0.0018	0.0021	0.0021	0.0021	0.0028
35	0.2579	0.5341	2767	0.0006	0.0010	0.0015	0.0019	0.0023	0.0024	0.0025	0.0029	0.0032
36	0.2572	0.5305	2799	0.0006	0.0008	0.0011	0.0015	0.0017	0.0019	0.0020	0.0025	0.0028
37	0.2574	0.5279	2807	0.0006	0.0009	0.0012	0.0016	0.0018	0.0021	0.0022	0.0027	0.0030
38	0.2586	0.5295	2773	0.0004	0.0008	0.0011	0.0014	0.0017	0.0018	0.0020	0.0022	0.0026
39	0.2595	0.5302	2751	0.0005	0.0009	0.0012	0.0016	0.0020	0.0021	0.0022	0.0025	0.0029
40	0.2574	0.5290	2801	0.0005	0.0008	0.0012	0.0016	0.0018	0.0019	0.0021	0.0026	0.0028
41	0.2584	0.5270	2788	0.0005	0.0008	0.0011	0.0014	0.0017	0.0019	0.0021	0.0024	0.0027
42	0.2564	0.5298	2818	0.0004	0.0007	0.0012	0.0016	0.0018	0.0020	0.0021	0.0024	0.0028
43	0.2561	0.5311	2819	0.0006	0.0009	0.0013	0.0017	0.0020	0.0022	0.0025	0.0027	0.0031
44	0.2572	0.5323	2790	0.0004	0.0008	0.0011	0.0015	0.0017	0.0019	0.0021	0.0021	0.0025
45	0.2560	0.5294	2830	0.0004	0.0007	0.0011	0.0015	0.0017	0.0019	0.0021	0.0024	0.0027
46	0.2549	0.5277	2862	0.0006	0.0008	0.0013	0.0016	0.0020	0.0022	0.0024	0.0026	0.0030
47	0.2568	0.5316	2802	0.0004	0.0007	0.0010	0.0014	0.0017	0.0018	0.0019	0.0022	0.0026
48	0.2546	0.5285	2866	0.0007	0.0008	0.0014	0.0018	0.0022	0.0024	0.0026	0.0031	0.0034
49	0.2593	0.5320	2748	0.0007	0.0011	0.0013	0.0017	0.0020	0.0021	0.0024	0.0025	0.0030
50	0.2575	0.5306	2792	0.0004	0.0007	0.0010	0.0014	0.0017	0.0018	0.0020	0.0021	0.0026
Ave.	0.2575	0.5303	2794	0.0005	0.0008	0.0012	0.0015	0.0018	0.0019	0.0022	0.0023	0.0028
Med.	0.2574	0.5302	2792	0.0005	0.0008	0.0011	0.0015	0.0018	0.0019	0.0021	0.0023	0.0028
st dev	0.0014	0.0021	34.3730	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002
Min.	0.2546	0.5270	2746	0.0003	0.0004	0.0009	0.0013	0.0015	0.0013	0.0017	0.0018	0.0025
Max.	0.2597	0.5360	2866	0.0007	0.0011	0.0015	0.0019	0.0023	0.0024	0.0026	0.0031	0.0034



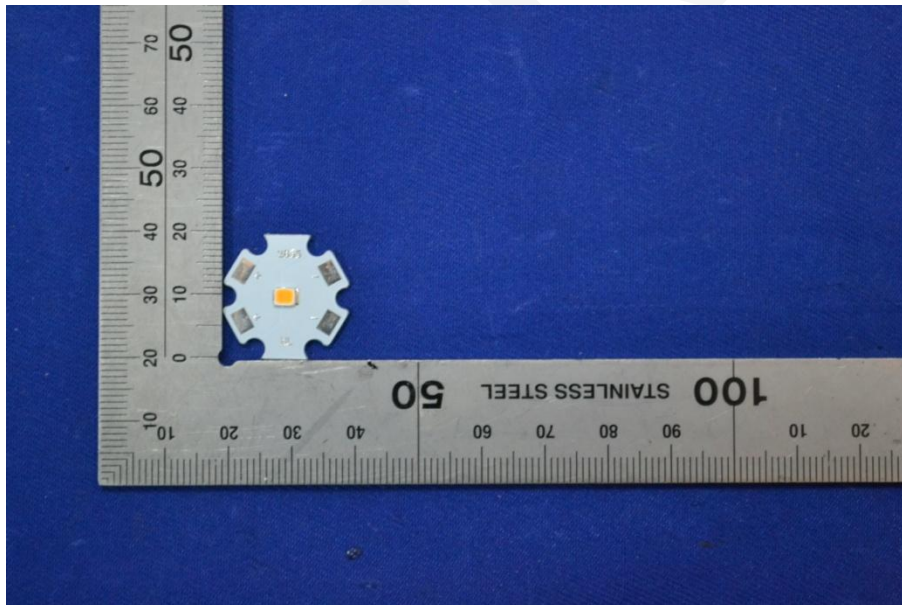
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



Report Revision

Report Number	Report Date	Contents
RSZ161122518-10-9000	2017-12-22	Original report.
RSZ161122518-10-9000-M1	2018-03-26	Update the data of Power Density per LED die in page 3.
RSZ161122518-10-9000-M2	2019-01-14	Update the Logo of lab on the Page1 Update Company name and address on page 1.

*****END OF REPORT*****

FINAL